Exhibit A

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Virtualized Striping IDE Controller

PURPOSE

To enhance the system performance of the IDE hard disk controller.

BACKGROUND

Over the years personal computers have continued to improve in performance. Newer software operating systems and applications continue to push the hardware requirements of personal computers. Multi-media, 3D graphics, and workstation applications continue to drive the requirements for a higher performance disk drive system.

ADVANTAGES

This invention allows two or more IDE disk drives to be striped without adding any software or driver impact. There are several advantages, they include:

- 50-70% improvement in disk performance over non-striped drives.
- No OS-specific drivers to support full striping. Normal methods used to implement IDE striping require specific software drivers.
- Lower-cost over previous striping implementations.
- Striping can be performed over the primary IDE channel only, leaving the secondary channel available for other peripherals. Other striping methods typically require both the primary and secondary channels, leaving no channels available for other peripherals (e.g. CD-ROM, tape-backup, etc.).

IDEA/IMPLEMENTATION

Striping is a method of increasing data transfer rate by alternating data between two drives. During read/write operations, both drives are accessed simultaneously, doubling the effective transfer rate.

Many IDE disk controllers already implement striping. Controllers from companies such as UltraStor, Promise, TekRAM, and OPTi offer striping controllers as an add-in card. These controllers stripe the data by simultaneously reading data from the primary and secondary IDE channels. Software drivers are then used to encode and decode the striped data streams.

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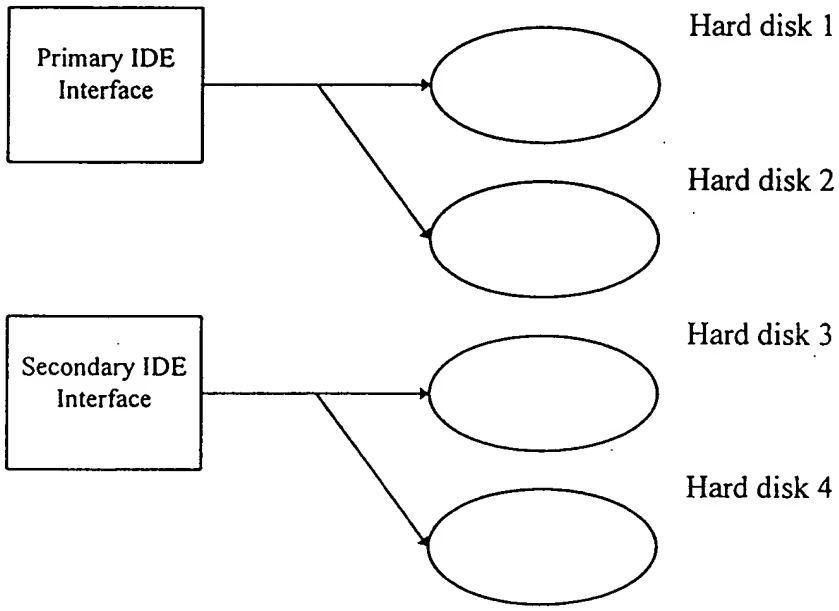
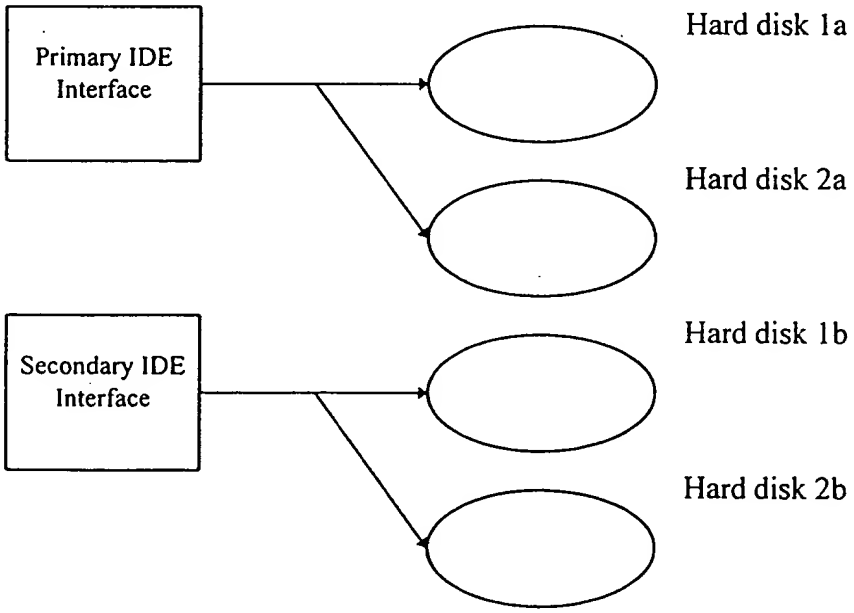
In this proposed implementation, striping is achieved by creating two primary channels and/or two secondary channels. The two physical channels are then virtualized into a single logical channel using hardware.

The following diagram shows the standard IDE interface:



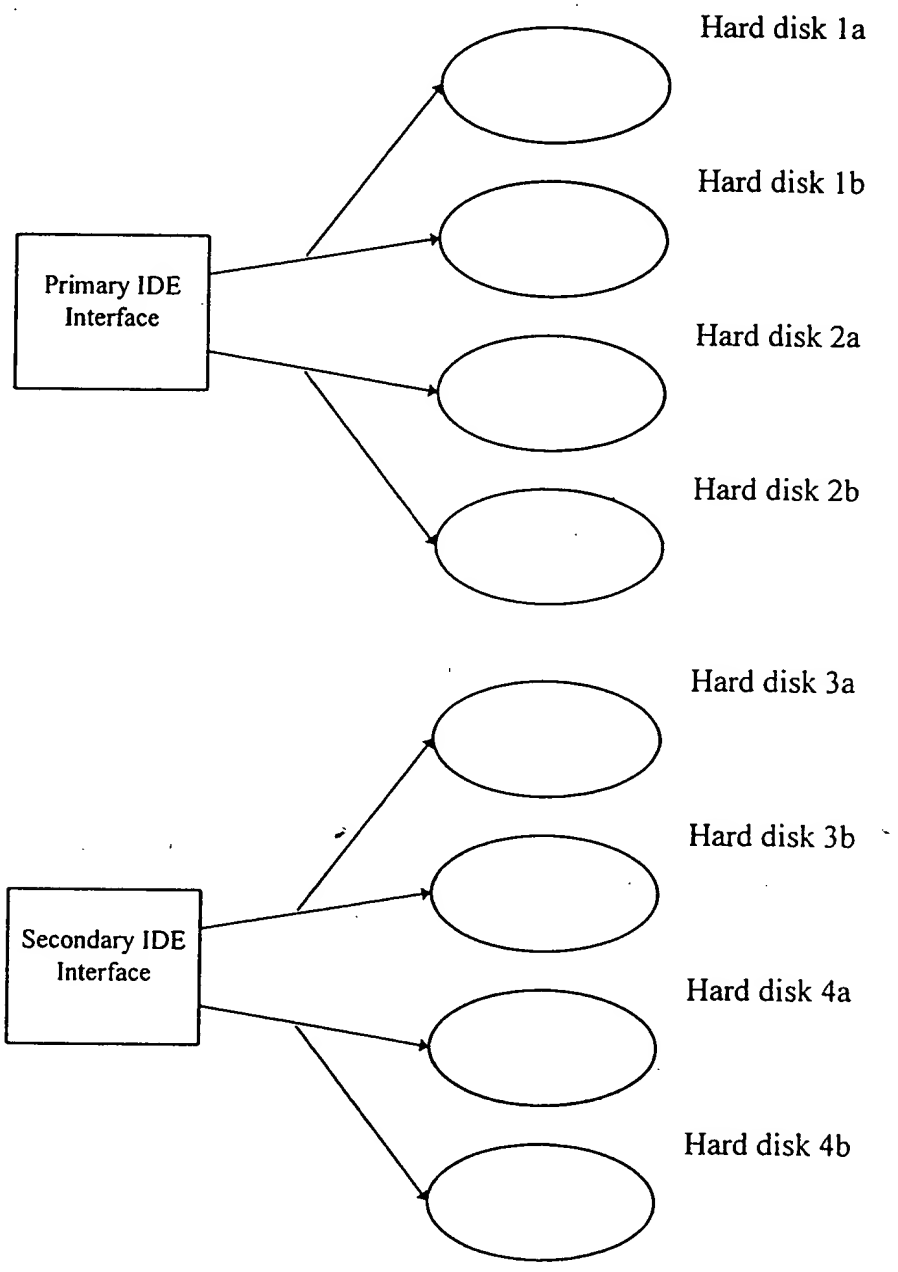
In this method a maximum of four physical hard disks (1, 2, 3, 4) and four logical hard disks (1, 2, 3, 4) exists. Each logical hard disk is mapped to a single physical hard disk.

The following diagram shows the standard method of striping IDE:



this method, a maximum of four physical hard disks (1a, 1b, 2a, and 2b) and two striped logical hard disks (1, 2) exists. Each logical hard disk is mapped to two physical hard disks through a software driver.

The following diagram shows the new method of striping IDE:



In this method a maximum of eight physical hard disks (1a, 1b, 2a, 2b, 3a, 3b, 4a, and 4b) and four logical hard disks (1, 2, 3, 4) exists. Each logical hard disk is mapped to two physical hard disks through hardware. From the software level, the logical hard disk looks like a single physical hard drive with twice the capacity.

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The specific implementation is to perform "sector stripping". Here sequential data sectors occur on alternating drives. Each IDE interface sends the "odd" sector requests to one drive while "even" sector requests are sent to an alternate drive.